

REMARKS

Claims 1-24 are pending. By this amendment, claims 1, 14 and 15 are amended and new claims 23 and 24 are added. Support for new claim 23 may be found, for example, at page 12, lines 12-14 and support for new claim 24 may be found, for example, at page 10, lines 5-25.

The October 30 telephone interview is made of record. Applicants gratefully acknowledge the courtesies extended by Examiner Vanore to Applicants' representative, Mr. Hunt. The substance of discussions during the interview are incorporated into the following remarks.

I. Claims 1-23 Define Patentable Subject Matter

The Office Action rejects claims 1-22 under 35 U.S.C. §102(b) over U.S. Patent 4,980,562 to Berrian et al. The rejection is respectfully traversed.

Applicants respectfully submit that Berrian does not teach or suggest all of the features of independent claims 1, 11, 14 and 15. For example, Berrian does not disclose forming an adjusted intensity profile from at least a portion of a beam at a first position and determining a direction or parallelism of the beam relative to a reference direction based on a position of the detected intensity profile relative to a position where the adjusted intensity profile is formed, as set forth in amended claim 1. Similarly, Berrian does not disclose blocking a portion of a beam with a beam modifier, identifying a position where a shadow is formed by the beam modifier and determining a direction or parallelism of the ion beam based on the position of the shadow relative to the position of the beam modifier, as set forth in claim 11. Independent claim 14 recites means for forming an adjusted intensity profile from at least a portion of the beam at a first position, and means for determining a direction or parallelism of the beam relative to a reference direction based on a position of the detected intensity profile relative to a position where the adjusted intensity profile is formed. Berrian also does not disclose a beam modifier that alters an intensity profile of at least a portion of the charged particle beam, and a controller that determines a direction or parallelism of the charged particle beam relative to a reference direction based on a position where the intensity profile is detected by the at least one detector and a position where the beam modifier created the detected intensity profile, as set forth in amended claim 15.

As discussed during the October 30 telephone interview, Berrian does not teach or suggest determining a direction or parallelism of a charged particle beam in any manner, much less in the manner recited in the claims. For example, although Berrian may disclose forming an adjusted intensity profile from at least a portion of a beam, e.g., blocking of the beam by the Faraday detector 82 in Fig. 4 or deflecting the beam with scanning electrodes, Berrian does not teach or suggest detecting the adjusted intensity profile and determining a direction or parallelism of the beam based on the position where the adjusted intensity profile was formed and the position where the intensity profile is detected. In fact, Berrian makes no mention of determining the direction or parallelism of the beam in any way. The various deflectors and detectors are used by the Berrian system to properly align, direct, and scan the beam, as well as determine whether a workpiece is receiving a proper implantation dose. However, none of the deflectors or detectors are used by the system to determine beam direction or parallelism relative to a reference direction.

During the interview, the Examiner indicated that detecting beam direction and/or parallelism is inherent in the Berrian system. To be inherent, a feature must necessarily follow from or be a clear consequence of the described system. None of the system arrangements shown in Berrian would be capable of being used to determine beam direction or parallelism (although the systems could be rearranged in accordance with the description in this application to do so). A detector in the Berrian system detects the presence of the ion beam, but cannot be used to determine the direction or parallelism of the beam. The Faraday detectors 82, 86 104, 106 and others disclosed in Berrian are capable only of detecting charged particles that enter a slot or opening of the detector, and are thus incapable of determining the direction from which particles enter the detector. That is, the detector arrangements of Berrian cannot distinguish between beams that are directed from different angles toward the detectors. Given the system arrangement shown in Berrian, the detection of the presence of the beam by a Berrian detector could only be used to determine beam direction or parallelism if a position of the beam upstream of the detector was known. However, Berrian provides for no way to determine the position of the beam upstream of the detectors. For example, if the deflector 72 in Fig. 3 system of Berrian is slightly misadjusted, the beam 58 may be uncollimated, e.g., the beams at 58a and 58c may diverge, or the beam 58 may be misdirected. In such a case, the detectors 86, 104 or 106

positioned as shown in Figs. 5 and 6 could detect the presence of the beam in all cases. However, detection of the beam presence cannot be used to determine whether the beam 58 is collimated, uncollimated, misdirected, etc. because the beam position upstream of the detectors cannot be determined by the Berrian system. (Contrast this with the arrangement shown in Fig. 2 of this application, for example, where the positions of the modifier 2 and the detectors 3 are known.) The detectors configured as shown in Berrian are incapable of being used to make such measurements, and Berrian does not contain any teaching or suggestion to do so. As a result, simply because a detector in Berrian detects the presence of a beam does not itself indicate a parallelism or a direction of the beam.

Assuming for the sake of argument that the Berrian system is capable of forming an adjusted intensity profile or shadow from a beam and detecting an adjusted intensity profile or shadow that could be used to determine beam parallelism or direction, nothing in Berrian teaches or suggests how such information could be used to make such a determination. This is because Berrian assumes that the ion beam is properly directed and/or collimated with respect to the target 64. Thus, even if one of ordinary skill in the art wanted to determine beam parallelism or direction, no reference to Berrian would be made because Berrian in no way teaches or suggests how such a determination could or should be made.

Accordingly, claims 1, 11, 14, and 15, and claims 2-10, 12-13 and 16-23, which depend from claims 1, 11 and 15, are allowable. Withdrawal of the §102 rejection of claims 1-22 is requested.

II. Conclusion

Applicants submit that this application is in condition for allowance. Favorable consideration and prompt allowance of claims 1-24 are requested.

Should the Examiner believe that anything further is desirable to place the application in better condition for allowance, the Examiner is invited to contact the Applicants' undersigned representative at the telephone number listed below.


If this response is not considered timely filed and if a request for an extension of time is otherwise absent, Applicants hereby requests any necessary extension of time. If there is a fee

occasioned by this response, including an extension fee that is not covered by an enclosed check, please charge any deficiency to Deposit Account No. 50/0896.

Respectfully submitted

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Marked-up Claims

1. (Amended) A method for determining a direction or parallelism of a beam, comprising:

- forming a beam;
- forming an adjusted intensity profile from at least a portion of the beam at a first position
- detecting an intensity profile of at least a portion of the beam downstream of the first position; and
- determining a direction or parallelism of the beam relative to a reference direction based on a position of the detected intensity profile relative to a position [of] where the adjusted intensity profile [formation] is formed.

14. (Amended) An apparatus for determining a direction or parallelism of a beam, comprising:

- means for forming a beam;
- means for forming an adjusted intensity profile from at least a portion of the beam at a first position;
- means for detecting an intensity profile of at least a portion of the beam downstream of the first position; and
- means for determining a direction or parallelism of the beam relative to a reference direction based on a position of the detected intensity profile relative to a position [of] where the adjusted intensity profile [formation] is formed.

15. (Amended) An apparatus for determining a direction or parallelism of a charged particle beam, comprising:

- at least one detector that detects an intensity profile of at least a portion of the charged particle beam;
- a beam modifier that alters an intensity profile of at least a portion of the charged particle beam upstream of the at least one detector; and
- a controller that determines a direction or parallelism of the charged particle beam relative to a reference direction based on [positions of] a position where the intensity profile is

detected by the at least one detector and a position where the beam modifier created [relative to a reference direction and] the detected intensity profile.

23. (New) The apparatus of claim 15, wherein the at least one detector includes at least three detectors and the controller determines a direction or parallelism of the charged particle beam in three dimensions relative to the reference direction.

24. (New) The apparatus of claim 15, wherein the direction or parallelism is determined based on detections of intensity profiles at a plurality of different positions.